

**WE CLAIM:**

1. A composition of matter represented by the general formula



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wherein Ln is selected from the group consisting of Sm, Gd and Y;

Ln' is selected from the group consisting of La, Pr, Nd, Pm, Eu, Tb, Dy, Ho, Er, Tm, Yb and Lu; A is selected from the group consisting of Mg, Ca, Sr and Ba,

$0.05 \leq x \leq 0.25$ ,  $0 \leq x' \leq 0.25$ ,  $0 \leq y \leq 0.03$ ,  $0.001 \leq z \leq 0.03$ ,  $0.05 \leq x + x' \leq 0.25$

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$0.001 \leq y + z \leq 0.03$ , wherein  $\delta$  is a number which renders the composition of matter charge neutral.

2. The composition of matter of claim 1 wherein Ln is Sm.

3. The composition of matter of claim 1 wherein A is Mg.

4. The composition of matter of claim 1 wherein  $0.1 \leq x \leq 0.2$ .

5. The composition of matter of claim 1 wherein  $y = 0$ .

6. The composition of matter of claim 1 wherein  $x' = 0$ .

7. A. composition of matter represented by the general formula

$\text{Ln}_x\text{Ti}_z\text{Ce}_{1-x-z}\text{O}_{2-\delta}$  wherein Ln is selected from the group consisting of Sm, Gd and Y,  $0.05 \leq x \leq 0.25$ ,  $0.0025 \leq z \leq 0.02$  and  $\delta$  is a number which renders the composition of matter charge neutral.

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8. The composition of matter of claim 7 wherein Ln is Sm.

9. The composition of matter of claim 7 wherein Ln is Gd.

10 10. The composition of matter of claim 7 wherein Ln is Y.

11. A method of manufacturing a solid electrolyte comprising a composition of matter having a density greater than 95% theoretical density represented by the general formula

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wherein Ln is selected from the group consisting of Sm, Gd, Y, and mixtures thereof;

Ln' is selected from the group consisting of La, Pr, Nd, Pm, Eu, Tb, Dy, Ho, Er, Tm, Yb

20 and Lu; A is selected from the group consisting of Mg, Ca, Sr and Ba,  $0.05 \leq x \leq 0.25$ ,

$0 \leq x' \leq 0.25$ ,  $0 \leq y \leq 0.03$ ,  $0.001 \leq z \leq 0.03$ ,  $0.05 \leq x + x' \leq 0.25$ ,  $0.001 \leq y + z \leq 0.03$ ,

wherein  $\delta$  is a number which renders the composition of matter charge neutral, said method comprising the steps of.

(a) forming a mixture by mixing metal-containing materials corresponding to the metals in the composition of matter to establish the stoichiometric coefficients of the metals of the composition of matter;

5 (b) forming the mixture into a desired shape for the solid electrolyte; and

(c) sintering the desired shape at a temperature of less than or equal to 1600 °C to form the solid electrolyte having a density greater than 95% theoretical density.

10 12. The method of claim 11 wherein the metal-containing materials are metallic oxides.

13. The method of claim 12 wherein the metallic oxides have an average particle size of less than 5  $\mu\text{m}$ .

15 14. The method of claim 11 wherein mixing is effected by a technique selected from the group consisting of attrition milling, vibratory milling, ball milling and high shear mixing.